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ELECTRICAL STATISTICS AS A BAROMETER OF INDUSTRIAL ACTIVITY

By Robert M. Davis, *Statistical Editor, Electrical World*

Grimm's tale of the boy who possessed the seven-league boots is fully exemplified in the phenomenal growth of the electric light and power industry, which has developed by leaps and bounds and has become one of the fundamental elements of America's industrial fabric. There is probably no primary industry that can show such rapid statistical growth. Certainly none can show a more enthusiastic adoption by the American people, both in the home and in the factory.

During the past six years the yearly output of the central generating stations of the country has increased from 16,782,000,000 kilowatt-hours in 1914 to 45,678,000,000 kilowatt-hours in 1920, or 173 per cent. During the same period the annual gross revenue increased from $336,980,000 to $882,750,000, or 162 per cent. The installed rating of the central generating plants has increased from 7,000,000 kilowatts in 1914 to 13,750,000 kilowatts on January 1, 1921, and during the same period the capital invested in the light and power industry has increased from $2,706,000,000 to $4,050,000,000.

These figures point to several pertinent conclusions, but above all they show clearly that electrical energy has fused itself into the very heart of American life; that it is no longer an experiment or a luxury, but a power controlling, and so reflecting, both the domestic and the industrial life of our country. In a section of the country that today has poor electric facilities one unfailingly finds a community practically without industrial life, except possibly agriculture or mining; and as a rule the inhabitants of that region are either nomads or are living far below the average scale to be found in the remaining portions of the United States.

The production of electrical energy by the central generating plants of the country depends upon two separate and distinct elements, the domestic and municipal lighting load, and the industrial or manufacturing load. The lighting load varies with the season, increasing materially in the fall and winter and decreasing as the winter wanes and the long summer days approach. The industrial demand for electrical energy, on the other hand, depends solely upon the rate of operations in the various industries. A slack season during which only a portion of the machinery is placed in operation results in a call for less electrical energy for power purposes, while a season of intense industrial activity may result in a power demand far in excess of the power companies' capacity to fulfil. Every American industry has now adopted electrical energy as a source of power to such an extent that the least depression in any primary industry in any section of the country is at once reflected in the operation of the central generating plants that furnish electrical energy to that section. As time passes and industry is more and more electrified, the reports of central station operations will more fully reflect industrial activity. But to the trained statistician, ready to read between the lines and to notice the least variance in the operation of the light and power industry, it is now possible to interpret central station monthly returns in such detail that with a general knowledge of industrial affairs the extent of productive curtailment in any industry can be readily ascertained. Such interpretation may be made for a certain city or community, based upon the detail returns of one or more of the electric light and power companies serving that community. Or industrial conditions in a large section of the country may be clearly defined by a study of group operation figures from a large percentage of the light and power companies of that section. And, finally, the general tone of industrial America is pictured in an unmistakable manner by the tabulation of the monthly operations of a large percentage of the light and power companies of the country.

Let us study briefly the output figures of the central generating and distributing companies of the country for the month of March, 1921, as received by the Statistical Department of the *Electrical World.* Reports are received from companies representing 78 per cent of the installed rating of the central generating plants of the country; the 22 per cent not making returns are small plants located for the most part in purely agricultural regions. Reports are received monthly for electrical output, gross revenue, and operating and maintenance expenses. The story which the gross revenue and operating expenses tells is a very important one to the light and power industry, but it has little bearing on the subject under consideration.

Table I gives the aggregate central station returns for the twelve month period ending with March, 1921. Table II gives similar figures for the same period, but by the five sections of the country. The diagram shows the electric light and power operations for the past three years.

Returns of central station operations received by the *Electrical World* for the month of March, as shown in these tables, clearly indicated a resumption of industrial activity in every section of the country. In spite of the rapidly advancing season and the correspondingly decreased lighting requirements, the average daily output was 100,000 kilowatt-hours in excess of that reported for January, and 2,200,000 kilowatt-hours in excess of the February output. The estimated output during March of 3,648,000,000 kilowatt-hours was, however, 8 per cent below that of March, 1920; but it must be remembered that the spring of last year saw some of the most intense industrial activity in the history of the nation.

TABLE I

CENTRAL-STATION RETURNS FOR TWELVE MONTHS

	Percentage of installed ratings represented	Kw.-hr. output (companies reporting)			Percentage of installed ratings represented	Revenue from the sale of energy (companies reporting)		
		1920 Thousands	1919 Thousands	Per cent increase		1920 Thousands	1919 Thousands	Per cent increase
April	70	2,603,692	2,098,559	24.1	65	$45,547	$36,541	24.5
May	70	2,631,560	2,179,916	21.2	65	43,888	35,512	23.4
June	71	2,630,831	2,175,645	20.2	66	44,434	35,528	24.5
July	71	2,677,131	2,234,215	20.0	66	46,608	36,265	28.5
Aug.	71	2,769,175	2,303,099	20.1	66	47,410	36,713	29.1
Sept.	71	2,734,179	2,327,460	17.4	66	49,224	38,209	28.5
Oct.	71	2,797,625	2,499,488	11.9	66	51,370	41,055	25.1
Nov.	71	2,741,705	2,503,402	9.6	66	54,620	44,711	22.0
Dec.	71	2,792,554	2,648,746	5.4	66	57,697	48,580	18.6
		1921	1920			1921	1920	
Jan.	76	2,765,632	2,943,349	—6.0	70	58,855	50,861	15.8
Feb.	76	2,456,553	2,711,251	—9.4	70	55,778	48,624	14.8
Mar.	77	2,812,493	3,179,943	—11.6	72	55,706	49,014	13.7

	Percentage of installed ratings represented	Operating and maintenance expenses (companies reporting)			Operating Ratio					
					Steam plants		Hydro plants		Combined systems of steam and hydro	
		1921 Thousands of dollars	1920 Thousands of dollars	Per cent increase	1921	1920	1921	1920	1921	1920
Jan.	40	14,562	13,085	11.3	56.1	55.3	26.8	27.0	38.1	45.6
Feb.	43	15,085	13,640	10.5	55.6	54.5	22.9	26.0	44.1	47.3
Mar.	53	18,544	17,125	8.4	56.1	57.7	23.4	19.6	40.3	44.8

Taking the returns by sections and industrial centers of the country we find, from data issued by federal bureaus, that the general textile situation in New England showed a marked improvement over February. The boot and shoe industry of that section, which accounts for over 50 per cent of the shoe production in the United States, increased operations slightly over February, but was still operating at only about 50 to 75 per cent. From a close study of the companies serving the textile centers of Massachusetts, New Hampshire, and Connecticut, it was found that the operations of these power companies checked these

TABLE II

CENTRAL-STATION RETURNS BY SECTIONS OVER A TWELVE-MONTH PERIOD

	Month	Percentage of installed ratings represented	New England States			Percentage of installed ratings represented	Atlantic States			Percentage of installed ratings represented	North Central States			Percentage of installed ratings represented	South Central States			Percentage of installed ratings represented	Pacific and Mountain States		
			1920 Thousands	1919 Thousands	Per cent increase		1920 Thousands	1919 Thousands	Per cent increase		1920 Thousands	1919 Thousands	Per cent increase		1920 Thousands	1919 Thousands	Per cent increase		1920 Thousands	1919 Thousands	Per cent increase
Kw.-hr. Output	April....	82	187,174	144,922	29.1	65	883,264	701,778	25.9	74	857,467	687,751	24.7	56	135,140	99,877	35.2	79	540,647	464,231	16.7
	May....	82	188,566	148,186	27.5	65	854,631	711,276	20.0	74	862,127	700,095	23.5	56	137,779	98,815	39.2	79	588,457	521,544	12.6
	June....	82	189,934	149,607	26.5	66	865,714	721,688	19.9	74	855,013	681,780	25.5	56	132,733	99,660	33.2	79	587,437	522,901	12.2
	July	82	190,668	159,000	20.0	66	881,241	714,485	23.5	74	841,351	702,302	19.7	56	138,937	106,460	30.1	79	614,934	551,959	13.4
	Aug.....	82	194,028	171,002	13.5	66	905,170	728,097	24.2	74	891,712	750,787	18.6	56	147,082	111,573	32.0	79	631,183	541,640	16.5
	Sept.....	82	194,730	170,593	14.1	66	905,872	758,737	19.5	74	878,237	758,017	15.9	56	147,524	113,649	30.0	79	607,816	526,464	15.5
	Oct.	82	196,310	191,132	2.7	66	964,739	841,694	14.5	74	896,241	817,757	9.5	56	157,267	126,769	24.1	79	583,068	522,136	11.7
	Nov.....	82	193,231	183,624	5.4	66	953,436	825,011	15.5	74	895,229	861,352	10.5	56	144,889	125,438	15.0	79	554,920	507,977	9.2
	Dec.....	82	210,494	227,403	—7.4	66	969,909	917,945	5.7	74	903,628	852,264	5.9	56	140,485	133,419	5.3	79	568,038	517,715	9.6
			1921	1920			1921	1920			1921	1920			1921	1920			1921	1920	
	Jan.	81	200,269	247,800	—19.2	77	1,003,223	1,043,650	—3.9	73	860,643	956,078	—10.0	62	144,936	145,336	—0.3	81	556,561	550,685	1.1
	Feb.	81	178,694	216,890	—17.6	77	901,942	969,318	—7.0	73	790,935	883,545	—10.5	63	131,654	132,537	—0.7	81	453,928	508,961	—10.8
	Mar.....	81	204,952	230,125	—10.9	79	1,028,624	1,117,441	—8.0	73	895,900	943,470	—5.0	63	139,650	136,971	1.9	81	543,367	751,936	—27.2
			1920	1919			1920	1919			1920	1919			1920	1919			1920	1919	
Revenue	April....	82	$5,087	$3,943	29.0	64	$17,700	$14,383	23.5	57	$12,690	$10,042	26.9	54	$2,952	$2,181	35.2	79	$7,118	$5,992	19.2
	May	82	4,897	3,741	30.1	64	16,624	13,631	21.9	57	12,471	9,853	26.8	54	2,829	2,140	32.0	79	7,067	6,147	15.1
	June....	82	4,948	3,778	30.5	65	16,525	13,449	22.1	57	12,412	9,776	26.9	54	2,849	2,127	33.9	79	7,700	6,398	20.5
	July	82	5,009	3,802	28.5	65	16,899	13,438	25.5	57	12,822	9,793	30.9	54	2,747	2,194	35.0	79	9,131	6,948	31.5
	Aug.....	82	5,075	4,093	24.0	65	17,210	13,731	25.9	57	13,497	10,151	32.9	54	3,168	2,281	38.1	79	8,460	6,457	31.1
	Sept.....	82	5,409	4,296	25.9	65	18,081	14,456	24.5	57	13,834	10,522	31.5	54	3,262	2,386	36.5	79	8,638	6,549	32.0
	Oct......	82	5,675	4,623	22.7	65	19,201	15,722	22.0	57	14,458	11,667	23.9	54	3,504	2,551	37.3	79	8,532	6,492	31.5
	Nov.....	82	5,898	5,017	17.5	65	20,938	17,119	22.2	57	15,158	12,561	20.8	54	3,853	2,910	32.4	79	8,775	7,104	23.5
	Dec.	82	6,548	5,744	14.0	65	22,332	19,149	16.7	57	16,004	13,142	21.8	54	3,722	3,113	19.8	79	9,091	7,432	22.3
			1921	1920			1921	1920			1921	1920			1921	1920			1921	1920	
	Jan.....	81	6,379	6,170	3.5	74	22,180	19,225	15.3	59	16,818	14,436	17.3	62	4,155	3,484	19.3	81	9,323	7,546	23.6
	Feb.	81	5,925	5,728	3.4	74	21,489	18,317	17.4	59	15,981	14,071	13.7	62	3,915	3,329	17.6	81	8,468	7,179	18.0
	Mar.....	81	5,788	5,566	3.8	76	21,761	18,870	15.4	59	15,945	14,108	12.5	63	3,869	3,246	19.2	81	8,489	7,224	17.5
Operating Expenses:			1921	1920			1921	1920			1921	1920			1921	1920			1921	1920	
	Jan.....	34	$1,098	$1,288	—14.7	48	$6,373	$5,411	17.8	28	$3,941	$3,451	14.2	37	$1,015	$905	12.2	54	$2,135	$2,030	5.2
	Feb.	35	1,069	1,242	—13.9	53	6,799	5,937	14.5	29	3,958	3,445	14.8	44	1,217	1,056	15.5	55	2,042	1,963	3.9
	Mar.....	46	1,560	1,642	—5.0	59	7,874	7,274	8.2	35	4,597	4,191	9.8	53	1,704	1,453	17.3	79	2,809	2,565	9.4

government data almost exactly. The companies serving large shoe factories reported an average daily output practically equal to that of February, which fact indicated a slight resumption of activity in the shoe factories, since otherwise the advancing season would have reduced the energy demand by reason of reduced lighting requirements. These and other increases in the industrial load of this section resulted in an increased daily energy output over February of 280,000 kilowatt-hours, and reflected almost perfectly the degree of increased industrial activity.

During March the Atlantic States presented two conflicting tendencies. In the Middle Atlantic States, which group includes the great industrial states of New York, New Jersey, and Pennsylvania, there was a material increase of activity among the industries closely allied with the automobile industries; but on the other hand, the iron and steel industry and other metal products experienced a decidedly greater slump during that month, and the coal-mining districts, such as those of West Virginia, were operating at only about 25 per cent capacity. The reports of light and power companies serving the automobile centers of New York State were materially in excess of those made during previous months in spite of the rapidly advancing season. On the other hand, companies serving the large iron and steel districts, and especially the coal mining districts, showed almost unprecendented drops in electrical output.

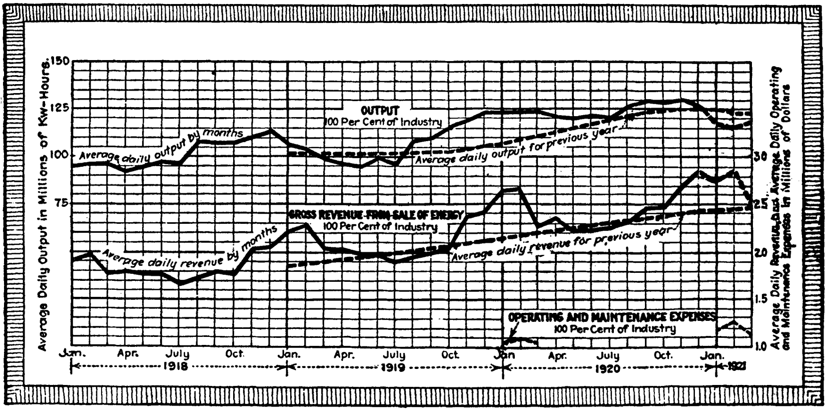
In the South Atlantic States conditions were reported as fast approaching normal in the textile and lumber industries which consume over 46 per cent of the electrical energy generated in the Southern States. Reports from light and power companies operating in the Southern States showed a small increase in the aggregate, which would undoubtedly have been much larger had the decreased lighting load not tended to pull down the gains from an increased industrial power load.

Taking the Atlantic Section as a whole, therefore, we find that the increased power requirements of the South and of a few industries of the Middle Atlantic States were sufficient to overcome the curtailments of the steel and coal-mining industries, resulting in an increased daily output in the Atlantic States of 3,600,000 kilowatt-hours over that reported for February.

Similar conflicting tendencies were also experienced in the North Central States. The greatly decreased power requirements of the iron and steel industry were more than offset by the greatly increased energy requirements of the automobile and related industries, operations in which increased more than 63 per cent over those of February.

But after accounting for the decreased lighting requirements, the resulting energy output of this section was only a trifle more than that reported for February, indicating a slight increase in industrial activity in the aggregate.

Activity in all the copper, lead, and coal mining centers of the Mountain States was considerably curtailed during March, and general industrial activity in this section was at a low ebb. Reports from light and power companies in the Mountain States indicated these very conditions in their subnormal electrical output. Generally speaking, conditions throughout the Pacific States were slightly improved, and the increased electrical output of these three states was sufficient to make the aggregate average daily output of the Mountain-Pacific States about 8 per cent greater than that reported in February.



Central Station operations through March, 1921

Knowing the location of the various classes of industrial activity, and having at hand a report of the operations of the light and power companies serving these centers, it is entirely possible to plot the degree of industrial activity in any section or industrial center, and for any special industry in that center. Were it possible to obtain detailed reports of the distribution of the central station generating load among the various industries, a study of the monthly operations of the electric light and power industry would give the most accurate story obtainable of industrial activity.

Most government and private reports on industrial conditions are based on returns from a small percentage of the manufacturing plants, and generally it is only the larger plants that make the necessary reports. The electric light and power industry, however, goes into all kinds of industrial life, both large and small. The interpretations which are to be drawn from the operations of the energy-producing plants tell the story not only of the larger industrial plants but of the small factories also. In a word, the real condition of affairs in the industrial world is accurately pictured by the operations of the electrical industry. And this must be more and more the case each year. The central generating stations cannot install generators and distributing systems fast enough to keep up with the demands of the industrial world for electrical energy.

Each new industrial customer means just one more step toward 100 per cent reflection of activity in all factories. Many plants possibly will never be electrified; but the large proportion which will be electrified will be sufficient to render the monthly reports of electric light and power companies true weathervanes of the storms approaching in the industrial skies and of the lifting of the clouds of depression which may have settled over industry as a whole.

We have a new prophet in our midst. Let us not fail to recognize him and his power and to give to the electric light and power industry the place that it deserves, not only as a great deliverer of mankind from drudgery and darkness, but also as a true prophet of that which is and that which is to come.